Canada - Manitoba

FLOOD DAMAGE REDUCTION PROGRAM

Annual Report

1988 - 1989

October 1989

Government of Canada Gouvernement du Canada

Government of Manitoba Gouvernement du Manitoba

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CANADA — MANITOBA FLOOD DAMAGE REDUCTION PROGRAM

The Honourable Lucien Bouchard
Minister
Department of the Environment
Ottawa, Ontario K1A 0H3

The Honourable Harry Enns
Minister
Department of Natural Resources
Winnipeg, Manitoba R0C 0V8

Gentlemen:

I am pleased to present the twelfth Annual Report of the Canada-Manitoba Steering Committee on the Flood Damage Reduction Program. This report covers the progress made during the period April 1, 1988 to March 31, 1989. The work in the program is authorized by the Agreement Respecting Flood Risk Mapping and the Agreement Respecting Studies for Flood Damage Reduction signed by Canada and Manitoba on December 20, 1976, by the Amending Agreement signed on March 31, 1981, by the Amending Letters of Exchange signed on September 6, 1985, and by the Agreement Respecting Flood Forescasting signed on March 31, 1981.

No progress was made on the flood risk mapping and studies work programs during the period of this report. This was because the Agreement Respecting Flood Risk Mapping had expired and the funding under the Agreement Respecting Studies for Flood Damage Reduction had been exhausted by the end of the previous reporting period. A proposal was prepared to extend the General Agreement Respecting Flood Damage Reduction to March 31, 1999, the Agreement Respecting Flood Risk Mapping to March 31, 1996 with $500,000 in additional funding and the Agreement Respecting Studies for Flood Damage Reduction to March 31, 1996 with $200,000 in additional funding. The proposed agreement extensions also incorporate maintenance features for the national Flood Damage Reduction Program to ensure the continued effectiveness of the program by maintaining the underlying policies beyond the termination date currently specified for the General Agreement. To date, Manitoba Treasury Board Approval has been obtained. However, Environment Canada has not yet completed its review of the proposal. An intensive review was required because the precedent-setting implications of the extensions to the Manitoba Flood Damage Reduction agreements may serve as a guideline for upcoming negotiations with other provinces.

Good progress continued on the application of computer-based flood forecasting methods and on improving conventional flood forecasting methodology under the Agreement Respecting Flood Forecasting. During the reporting period, expenditures of $115,002 were shared equally between Canada and Manitoba on the flood forecasting program.

Yours sincerely,

R.A. Halliday
Chairman, Steering Committee
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CANADA-MANITOBA
FLOOD DAMAGE REDUCTION PROGRAM

ANNUAL REPORT
FOR
THE PERIOD
APRIL 1, 1988 TO MARCH 31, 1989

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SUMMARY

The Flood Risk Mapping Agreement had expired on March 31, 1988 and as a result, no further work was possible on this phase of the Canada-Manitoba Flood Damage Reduction Program. No work was accomplished either in 1988-89 under the Agreement Respecting Studies for Flood Damage Reduction because the funding under this agreement had been exhausted in the previous year.

A proposal was prepared to extend the General Agreement Respecting Flood Damage Reduction by five years to March 31, 1996, the Agreement Respecting Flood Risk Mapping by eight years to March 31, 1996 with $500,000 in additional funding and the Agreement Respecting Studies for Flood Damage Reduction by seven years to March 31, 1996 with $200,000 in additional funding. The proposed agreement extensions would permit completion of high priority mapping, designation and studies projects, followed by a program evaluation and a maintenance program. The maintenance program would provide for revisions to be made to flood risk maps to reflect changes in hydrologic or hydraulic conditions, to upgrade "interim" designated maps for final designation, to correct errors (if any) on present flood risk maps and to extend flood risk mapping to those unstudied areas of communities experiencing development pressure.

During the period of this report, Manitoba Treasury Board Approval was obtained on the above proposal. However, Environment Canada has not yet completed its review of the proposal. This review was required because the precedent-setting implications of the extensions to the Manitoba Flood Damage Reduction Agreements may serve as a guideline for upcoming negotiations with other provinces.

Work continued on the application of computer-based flood forecasting methods and on improving conventional flood forecasting methodology under the Agreement Respecting Flood Forecasting. During the period of this report, expenditures of $115,002 were shared equally between Canada and Manitoba on the flood forecasting program. To date, $2,346,113.57 has been spent on flood risk mapping activities, $302,216.64 on flood damage reduction studies and $934.646.51 on flood forecasting activities.

CHAPTER I

THE CANADA-MANITOBA FLOOD DAMAGE REDUCTION AGREEMENTS

Manitoba was one of the first provinces to participate in the national Flood Damage Reduction Program on December 20, 1976 by signing a "General Agreement Respecting Flood Damage Reduction" and two sub-agreements. The General Agreement states the basic approach and the policies agreed upon by the two governments. The sub-agreements provide for flood risk mapping and floodplain management studies. Additional sub-agreements on improving flood forecasting capabilities and on constructing flood protection works were signed later. These agreements recognize that the best way to reduce potential flood damage is to keep flood prone development out of the floodplain. Protecting existing development could involve a combination of structural and non-structural alternatives, including allowing some flooding to occur.

I.1 Introduction

The twelfth annual report reviews work activities and progress of the Canada-Manitoba Flood Damage Reduction Program during the period April 1, 1988 to March 31, 1989.

I.2 General Agreement Respecting Flood Damage Reduction (FDR)

The General Agreement outlines the policies respecting government programs in flood risk areas and provides a co-ordinated framework for a number of implementation sub-agreements. Listed below are the agreements which are now in effect.

I.3 Agreement Respecting Flood Risk Mapping

This agreement provides for a flood risk mapping program to determine and subsequently designate those urban areas within Manitoba that are prone to flooding. Appendix A lists "Areas and Floodways to be Mapped in the Province of Manitoba" as described in the original Mapping Agreement, including the additions and deletions incorporated in the Amending Agreement (noted below). Provincial and federal Orders-in-Council were passed to add the main rivers in Winnipeg to the schedule of centres to be mapped. A public information program is conducted to inform people of the merits of the program, and to encourage acceptance and active participation.

I.4 Agreement Respecting Studies for Flood Damage Reduction

This Agreement provides for studies in specific problem areas to determine the most suitable measures for reducing or mitigating the damaging effects of floods on existing developments.

I.5 Amending Agreement, 1981

In order to complete all the work scheduled in the Flood Risk Mapping Agreement and because of the need for additional funds, an amending agreement was negotiated between Canada and Manitoba during 1980-81. The General Agreement was extended to December 31, 1990. The Mapping Agreement was extended to December 31, 1984 with additional funds of $1,490,000. The termination date of the Studies Agreement was changed to December 31, 1985 with no additional funding. Beausejour was removed from the list of places to be mapped because no serious flood problem exists there. It was replaced by the town of Gimli.

I.6 Amendments, 1985

Further amendments to the three flood damage reduction agreements were negotiated between Canada and Manitoba and concluded by an exchange of letters on September 6, 1985. The amendments were necessary in order to carry out the work scheduled in the Agreement Respecting Flood Risk Mapping and the Agreement Respecting Studies for Flood Damage Reduction. Specifically, the amendments were an extension to the General Agreement Respecting Flood Damage Reduction from December 31, 1990 to March 31, 1994; an extension of the Agreement Respecting Flood Risk Mapping from December 31, 1984 to March 31, 1988 with additional funds of $160,000; and an extension to the Agreement Respecting Studies for Flood Damage Reduction from December 31, 1985 to March 31, 1989. The Flood Risk Mapping Agreement and the Studies Agreement have now expired.

I.7 Agreement Respecting Flood Forecasting

The Flood Forecasting Agreement, a sub-agreement to the General Agreement, was signed by Canada and Manitoba on March 31, 1981. The objective of the Agreement is to improve the flood forecasting capability for the Red, Assiniboine and Souris rivers in Manitoba.

This Agreement is divided into two phases. The first phase included a pilot project on the Boyne River to develop a suitable improved streamflow forecasting model and to test and evaluate streamflow routing and field data acquisition systems. The second phase provides for the improvement of flood forecasting procedures for the Red, Assiniboine and Souris rivers.

Research to date has indicated that the conventional forecasting system has the potential, with some improvements, to provide forecasts of comparable accuracy with much less effort than the sophisticated model (HSPF) investigated under this Agreement. In order to complete these improvements and to meet the objectives of the Agreement, federal and provincial treasury board approvals were obtained to extend the Agreement

duration from March 31, 1986 to September 30, 1989 with additional funding of $400,000.

1.8 Agreement Respecting the Construction of Flood Protection Projects in Manitoba

The Agreement Respecting the Upgrading of Ring-Dykes in the Red River Valley was signed on March 10, 1983 to upgrade the ring-dykes at eight communities in the valley . This original agreement provided up to $4.5 million to raise existing ring-dykes at Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild and St. Adolphe to withstand a 100-year flood. The federal government has agreed to fund 45 per cent of the capital cost of each project while the Province is responsible for 55 per cent. Ring-dykes are the only practical measures to protect existing and future development in these communities. Flood waters spread out for many kilometres in the very flat valley and the alternative of diverting development to areas that are not flood prone is not feasible.

Amendments to the Agreement Respecting the Upgrading of Ring-Dykes in the Red River Valley were signed on May 22, 1985. The amendments consisted of an extension in time to March 31, 1989 and the provision of an additional $1.6 million in funding for upgrading the dyking system at the Village of Ste. Rose du Lac and the construction of a dyke protecting the water treatment plant at the Town of Souris. With the addition of Ste. Rose du Lac and Souris which are outside of the Red River Valley, the Agreement was renamed "An Agreement Respecting the Construction of Flood Protection Projects in Manitoba".

During 1988-89, dyke upgrading work continued at the communities of Emerson, St. Adolphe and Ste. Rose du Lac. Negotiation of the Agreement Respecting the Construction of Flood Protection Projects in Manitoba was co-ordinated by the Steering Committee responsible for the Flood Damage Reduction Program. However, this agreement is managed and reported on to the ministers directly by the Implementation Committee.

CHAPTER II

PROGRAM ORGANIZATION

II.1 Introduction

Under the terms of the General Agreement Respecting Flood Damage Reduction, a Steering Committee was established consisting of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. The Steering Committee provides direction for the program and reports to the Ministers annually.

A Technical Committee on Flood Risk Mapping was established under the terms of the Agreement Respecting Flood Risk Mapping. This committee also consists of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. It supervises and conducts the work program of the Agreement Respecting Mapping and the Agreement Respecting Studies for Flood Damage Reduction. The Technical Committee reports to the Steering Committee.

A Studies Sub-Committee was established in mid-1981 by the Steering Committee to oversee the work conducted under the Agreement Respecting Studies for Flood Damage Reduction. This Sub-Committee consists of three members. The federal Co-Chairman of the Steering Committee appointed one member, while the provincial Co-Chairman of the Steering Committee appointed two members.

A Technical Sub-Committee on Flood Forecasting was established by the Steering Committee to supervise and undertake tasks under the terms of the Agreement Respecting Flood Forecasting. The Sub-Committee consists of two members appointed by the federal Co-Chairman of the Steering Committee and two members appointed by the provincial Co-Chairman.

II.2 Membership: Steering Committee

Members of the Steering Committee in 1988-89 were:

Canada	Manitoba
Mr. R. A. Halliday (Co-Chairman) Director Inland Waters Directorate Western and Northern Region Environment Canada Regina, Saskatchewan	Mr. J. N. Whiting Director Municipal Planning Branch Manitoba Department of Municipal Affairs Winnipeg, Manitoba
Dr. R. D. Bjonback Chief, Water Planning and Management Inland Waters Directorate Environment Canada Regina, Saskatchewan	Mr. L. J. Whitney (Co-Chairman) Chief, Water Management Water Resources Branch Department of Natural Resources Winnipeg, Manitoba

In accordance with guidelines established in the General Agreement, the committee chairmanship alternated to the federal side of the Steering Committee. Mr. Halliday served as chairman at two meetings held in Winnipeg during the report year. Mr. G. Felton of Environment Canada, Inland Waters Directorate, Western and Northern Region, acted as secretary for the meetings.

II.3 Membership: Technical Committee on Flood Risk Mapping

Members of the Technical Committee in 1988-89 were:

Canada	Manitoba
Mr. H. K. Naik (Co-Chairman) Senior Water Resources Planner Water Planning and Management Branch Inland Waters Directorate Environment Canada Regina, Saskatchewan	Mr. F. P. Barlishen (Co-Chairman) Head Flood Damage Reduction Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. D. G. Anderson Chief Data Acquisition and Program Planning Topographical Survey Directorate Energy, Mines and Resources Canada Ottawa, Ontario	Mr. F. W. Leeman Chief Mapping Section Surveys and Mapping Branch Department of Natural Resources Winnipeg, Manitoba

There were no meetings held by the Technical Committee during 1988-89.

II.4 Membership: Studies Sub-Committee

Members of the Studies Sub-Committee in 1988-89 were:

Canada	Manitoba
Mr. H. K. Naik (Co-Chairman) Senior Water Resources Planner Water Planning and Management Branch Inland Waters Directorate Environment Canada Regina, Saskatchewan	Mr. F. P. Barlishen (Co-Chairman) Head Flood Damage Reduction Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
	Dr. H. Schellenberg Agricultural Resource Economist Department of Agriculture Winnipeg, Manitoba

II.5 Membership: Technical Sub-Committee on Flood Forecasting

Members of the Flood Forecasting Sub-Committee in 1988-89 were:

Canada	Manitoba
Mr. R. A. Hale (Co-Chairman) Regional Chief Water Resources Branch Inland Waters Directorate Environment Canada Winnipeg, Manitoba	Mr. V. M. Austford (Co-Chairman) Chief of Hydrotechnical Services Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. R. Raddatz Scientific Services Meteorologist Scientific Services Division Atmospheric Environment Service Environment Canada Winnipeg, Manitoba	Mr. R. J. Bowering Head Hydrology Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba

Mr. Hale was chairman during the report year. Two meetings were held in Winnipeg. Mr. J. Way of the Water Resources Branch, Environment Canada acted as secretary.

CHAPTER III

PROGRAM IMPLEMENTATION

III.1 Scope

Originally, flood risk maps and flood damage reduction studies were to be prepared for 45 communities in Manitoba as listed in Schedule A of the Agreement Respecting Flood Risk Mapping (this schedule with amendments and additions is shown as Appendix A of this report). A location map is attached as Appendix B. However, Canada and Manitoba signed an agreement on March 10, 1983 under which they have agreed to share the cost of upgrading existing dyking systems to the one percent protection level in eight of these communities. Therefore, mapping or studies are not necessary for the communities of Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild or St. Adolphe. Although the base maps have been completed for Ste. Rose du Lac, no flood risk mapping studies will be done as construction is under way on flood protection works in the community under the Flood Protection Projects Agreement.

Flood risk areas are determined and plotted on detailed engineering maps and smaller scale public information maps. Policies which discourage further flood-prone development come into effect when the Minister of the Environment for Canada and the Minister of Natural Resources for Manitoba designate the flood risk areas.

In communities where flood damage reduction studies are deemed necessary, an analysis is undertaken to determine the most economical and suitable measures to protect existing development from future flood damages. Agreements are negotiated to fund the construction of flood protection works, if such works are shown to be technically feasible and economically viable.

Research into developing improved flood forecasting procedures for the Red, Assiniboine and Souris rivers in Manitoba was conducted under the Agreement Respecting Flood Forecasting. This involved calibration of the HSPF hydrologic model on key tributaries of these rivers. Research into developing new forecasting procedures was concluded in 1985-86. At present, work is being directed towards improving the conventional forecasting system, mainly through improved data input and further use of computer systems.

A Canada-Manitoba flood forecasting centre was established in Winnipeg as part of Phase One under the Agreement Respecting Flood Forecasting.

III.2 Schedule

During the first year of the Flood Damage Reduction Program, a community work program schedule was prepared for the 45 centres to be mapped, based on flood history, and recognizing the potential for future developments in undeveloped urban flood prone areas. Since then, the City of Winnipeg and the Additional Zone were added to Schedule A, the General Agreement Respecting Flood Damage Reduction was extended to 1994, the Agreement Respecting Flood Risk Mapping to 1988, the Agreement Respecting Studies for Flood Damage Reduction to 1989, Phase One of the Flood Forecasting Sub-Agreement to 1984 and Phase Two to 1986. A further extension to the Agreement Respecting Flood Forecasting was requested and approved in 1987. A proposal on further extensions was prepared in 1988.

III.3 Methodology

III.3.1 Flood Risk Mapping

The work program at each community for the flood risk mapping and flood damage reduction (FDR) studies begins with the preparation of 1:2000 scale topographic base maps showing planimetric and height information. Base map production is carried out in four steps, namely, aerial photography, control survey, aerial triangulation and map compilation.

Following the map preparation, hydrologic studies are undertaken to determine the magnitude of the design flood and the watershed's response to flood-generating events. The results of these studies function as an input to the hydraulic studies which systematically define design flood water surface profiles throughout the communities. The resulting flood risk lines are delineated on the base maps which are then used for engineering and planning purposes.

The Steering and Technical committees consult with the local government officials, to ensure a local awareness of the intent and implications of the program. They also review the delineation of the flood lines with the local officials to seek their support in the implementaion of the policies of the program.

When the Steering Committee has concurred in the delineation of the flood risk area and floodway (where applicable), the preliminary flood lines, which are plotted on the 1:2000 scale maps, are presented to the local councils for their review. The Ministers are then asked for their approval of the designation. Public information maps and brochures are then prepared.

The public information program is conducted concurrently with the mapping process. Citizens of the community are made aware of the Flood Damage Reduction Program through meetings, brochures, maps and the media.

III.3.2 Flood Damage Reduction Studies

Flood damage reduction studies are undertaken for selected communities. The purpose is to determine the measure which has the most favourable benefit-cost ratio for minimizing the flood damage potential of existing development and also to guide future floodplain development practices. The studies describe present

land uses, assess potential flood damages and identify and evaluate alternatives for reducing the potential for flood damage. Among the range of measures considered are structural and non-structural alternatives such as dyking, flood proofing, flood forecasting systems, emergency action and zoning. Zoning and formulation of by-laws for flood prone lands at the local government level are encouraged by program officials.

In a community where a dyke exists, the flood damage reduction study would include a geotechnical study of the dyke to assess the dyke's stability and to determine the requirement, if any, for upgrading the dyke to a standard acceptable under the Flood Damage Reduction Program. A survey by questionnaire or some other means may be undertaken in some communities where a recent large flood occurred. This survey would be conducted to determine the exact extent of damage caused by that flood. The results can be used to estimate the damages that would be caused by other floods up to the design flood. Additionally, a field survey is conducted in most communities to determine the first floor elevations of all structures in the flood risk area. The study report is used as the basis for a recommendation to governments on construction of flood mitigation works or implementation of non-structural measures such as purchase of flood-prone properties.

III.3.3 Flood Forecasting

The Flood Forecasting Program was divided into two phases. Phase One, which was completed on February 3, 1984, consisted mainly of a review of streamflow simulation models and testing the most promising models on the Boyne River. Results of the detailed testing were analyzed and forecast accuracies were compared to those of current methods. The applicability of the models to other watersheds in the Assiniboine, Red and Souris river basins

was assessed to ensure that the selected model could be used throughout the study area. Other work in Phase One included establishment and testing of real-time hydrometeorological data acquisition systems and an evaluation of stream channel routing procedures. Phase Two originally provided for the further refining of the model for its application to the Red, Assiniboine and Souris watersheds. However, the study has indicated that the conventional forecasting methodology has the potential, with improvements, to provide forecasts of similar accuracy with significantly less effort.

III.4 Work Assignments

All work activities under the Flood Damage Reduction Program are conducted under the general direction of the Steering Committee. The Flood Risk Mapping Technical Committee, the Studies Sub-Committee and the Flood Forecasting Sub-Committee supervise the work in their respective programs, and report to the Steering Committee on progress of work and on major issues.

With the exception of Virden, the Pas and the supplementary sheets in Winnipeg, which were done by the Manitoba Surveys and Mapping Branch (MSMB), the 1:2000 base maps and smaller scale public information maps have been compiled by private contractors. The inspection responsibility of the mapping has been vested in the Director of the Topographical Survey Division, Surveys and Mapping Branch of the Federal Department of Energy, Mines and Resources with the exception of the inspection of the aerial photography and survey control which, de facto, has been the responsibility of the Surveys and Mapping Branch of the Manitoba Department of Natural Resources. The use of the Manitoba Surveys and Mapping Branch mapping specifications was approved by the Technical Committee in 1981. The Manitoba Surveys and Mapping Branch also has responsibility for the administration of tender invitation and awarding all contract work in accordance with the provincial contracting policies and the Canada-Manitoba Flood Damage Reduction Program.

The Water Resources Branch of the Manitoba Department of Natural Resources (MWRB) conducts all of the hydrologic and the majority of the hydraulic studies. Some hydraulic studies have been done by consultants and by Environment Canada. The MWRB is responsible for the administration of hydraulic study contracts. Cross-section surveys of the river channels are undertaken by the Engineering and Construction Branch of the Manitoba Department of Natural Resources.

The MWRB and Environment Canada, Regina, jointly conduct the public information program. The Communications, Economics and Planning Branch of Manitoba Natural Resources have played an important role in this program by preparing brochures for each community, liaising with local officials, arranging meetings with local councils and the public, preparing publicity for meetings, and providing information to all government agencies and municipalities on the implications of the Flood Damage Reduction Program.

The MWRB plays the lead role in the forecasting studies under the Flood Forecasting Program. Inland Waters Directorate and the Atmospheric Environment Service of Environment Canada, Winnipeg play the lead role in testing the real-time hydrometeorological data acquisition system. The Water Planning and Management Branch of Environment Canada in Ottawa has evaluated the applicability of dynamic channel routing on the Red River in Manitoba.

The Manitoba Department of Natural Resources provides the initial funding for the program and submits statements to Environment Canada for cost-sharing. Under the supervision of the Technical Committee, the MWRB is responsible for the overall administration of all contracts under the Flood Damage Reduction Program.

III.5 Expenditures

The Flood Risk Mapping Agreement originally provided for a total expenditure of $700,000 over five years. The Amending Agreement provided an

additional $1,490,000 to complete most of the required mapping. An additional $160,000 was provided in 1985-86 under a further extension. A total of $310,000 was available for flood damage reduction studies under the Agreement Respecting Studies for Flood Damage Reduction. A total of $600,000 was initially allocated to implement the Flood Forecasting Sub-Agreement. An additional $400,000 was approved by both parties in 1987.

Expenditures from December 20, 1976 to March 31, 1989 are summarized in Table I. These costs were shared equally by Canada and Manitoba.

CHAPTER IV

ACTIVITIES UNDER THE FLOOD DAMAGE REDUCTION AGREEMENTS 1988/89

During the report year, a proposal was prepared to extend the Flood Damage Reduction Program agreements. This proposal would extend the termination dates of the General Agreement Respecting Flood Damage Reduction to March 31, 1999, the Agreement Respecting Flood Risk Mapping to March 31, 1996 with $500,000 in additional funding and the Agreement Respecting Studies for Flood Damage Reduction to March 31, 1996 with $200,000 in additional funding.

IV.1 Flood Risk Mapping Program

Essentially, no work will be done under this Program until there is an agreement to continue the Flood Risk Mapping Program. The following designations have been made under the program to date.

IV.1.1 Designation

Melita	-	Interim	-	December 20, 1979
Wawanesa	-	Interim	-	December 20, 1979
Winnipeg	-	Interim	-	February 15, 1980
Souris	-	Final	-	October 1, 1980
Elie	-	Final	-	November 5, 1980
Brandon	-	Final	-	March 26, 1982
Starbuck	-	Final	-	November 26, 1982
Sanford	-	Final	-	November 26, 1982
La Salle	-	Final	-	November 26, 1982
Swan River	-	Final	-	May 11, 1982
Dauphin	-	Final	-	February 15, 1984
Carman	-	Final	-	June 13, 1984
Lorette	-	Final	-	September 13, 1984
Arborg	-	Final	-	November 5, 1987
Fisher Branch	-	Final	-	November 5, 1987
Riverton	-	Final	-	November 5, 1987

No work was done during the period of this report for the following communities.

Gimli: Gimli Airport Drain

Gladstone: Whitemud River

Grande Pointe: Seine River

Gretna: Pembina River

La Riviere: Pembina River

MacGregor: Beaver Creek)

IV.1.2 Melita: Souris River

Interim designation has been in effect since December 20, 1979. No work was done towards final designation during the period of this report.

IV.1.3 Minnedosa: Little Saskatchewan River

No work was done during the period of this report.

IV.1.4 Morden: Dead Horse Creek

The preparation of flood risk maps is complete. Designation can proceed once the FDR agreements are extended and the program is reactivated.

IV.1.5 Neepawa: Whitemud River

The preparation of flood risk maps is complete. Designation can proceed once the FDR agreements are extended and the program is reactivated.

IV.1.6 Ochre River: Ochre River

No work was done during the period of this report.

IV.1.7 Ste. Anne: Seine River

No work was done during the period of this report.

IV.1.8 Souris: Souris River

No work was done during the period of this report. The majority of dyking works protecting the water treatment plant at Souris were completed under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba.

IV.1.9 The Pas: Saskatchewan River

No work was done during the period of this report.

IV.1.10 Virden: Bosshill, Gopher and Scallion Creeks

No work was done during the period of this report.

IV.1.11 Wawanesa: Souris River

Interim designation took place on December 20, 1979. No work was done towards final designation during the period of this report.

IV.1.12 Westbourne: Whitemud River

No work was done during the period of this report.

IV.1.13 Winnipeg

The base mapping of the Charelswood and St. Norbert areas of Winnipeg is complete.

IV.1.13.1 Omands Creek

Flood risk mapping will not proceed for Omands Creek in Winnipeg.

IV.1.13.2 Red and Assiniboine Rivers and Tributaries

In 1987, the Minister of Manitoba Natural Resources received a request to modify the floodway limit on an area fronting on MacBell Road south of Coultier Drive in Fort Garry. Although modifying the floodway limit will not affect the conveyance of the Red River, development of this area will require approximately 3 m of fill. However, this re-designation cannot be finalized until there is an agreement to continue the Flood Risk Mapping Program.

IV.1.14 Woodside: Whitemud River

No work was done during the period of this report.

IV.1.15 Remaining Communities

As was reported in past annual reports, no work is planned for Hartney, Horndean, Rosenfeld or Thompson because of the low flood potential. Also, flood risk mapping will not proceed at Brunkild, Dominion City, Emerson, Letellier, Morris, Rosenort, St. Adolphe, St. Jean Baptiste or Ste. Rose du Lac as the Agreement Respecting the Construction of Flood Protection Projects in Manitoba will upgrade the level of protection offered by the existing dykes at these communities to conform to the one percent flood level. This level has been adopted as a minimum standard for the Manitoba FDR program.

As of March 31, 1989, the required flood protection works at Letellier, St. Jean Baptiste, Morris, Rosenort and Brunkild were completed.

IV.2 Flood Damage Reduction Studies Program

In previous years, flood damage reduction options were examined in studies completed for Ste. Rose du Lac (1977 and 1982), Souris (1981), and Brandon (1983). Other options were examined for Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild and St. Adolphe by the Ad Hoc Task Force on Manitoba Flood Mitigation Projects in 1981. Flood depth - damage curves were also developed from the flood damage data of the 1979 Red River flood in 1983. Table 2 shows the status of flood risk mapping and studies activities for each community on Schedule A.

Work on partially completed flood damage reduction studies for Elie, Morden and Riverton cannot resume until there is an agreement to continue the Flood Damage Reduction Studies Program.

IV.3 The Flood Forecasting Agreement

The reports on Phase One and Phase Two activaties were prepared for printing. A study entitled "Application of the HSPF Routing Method for Forecasting the Pembina River in Manitoba" was completed and a report was drafted.

Work continued on the application of the dynamic streamflow routing application on the Red River. Staff of the Water Planning and Management Branch, Environment Canada began transferrring the technology to the Manitoba River Forecast Centre. Testing and application of the routing model for real time forecasting was begun.

Operation of the Telidon weather radar system continued. The system provided information which was used for mapping precipitation in runoff forecasting.

A soil moisture modelling study was arranged with the University of Manitoba. This study should provide useful information for the Manitoba River Forecast Centre.

Staff that were hired under the Flood Forecasting Agreement continued to assist the regular staff of the forecast centre.

Six Telemark II water level data transmission devices were purchased during the report year. A list of recommended locations for the devices is being reviewed.

TABLE I

CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM

EXPENDITURES FOR 1977-88

	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
General Mapping	$ 1,000.00	$ 16,515.59	$ 18,315.52	$ 48,005.93	$ 38,506.47	$ 79,288.38
Arborg	-	-	-	10,667.29	11,212.08	6,583.48
Assiniboine River	-	-	-	1,032.00	-	-
Brandon	-	-	81,502.96	75,457.90	32,798.75	4,131.64
Carman	17,082.12	21,957.83	6,577.98	23,815.41	15,361.80	389.38
Dauphin	-	-	19.70	39,746.68	34,095.53	11,161.48
Elie	22,817.76	27,270.36	6,798.22	9,040.40	487.05	174.91
Fisher Branch	-	-	-	8,802.96	12,838.20	12,806.15
Gimli	-	-	-	22.55	31,333.93	1,373.00
Gladstone	-	-	-	12,208.25	21,558.28	2,442.35
Grande Pointe	-	-	21.55	14,760.86	11,969.46	-
Gretna	-	-	-	414.00	17,943.40	365.00
Hartney	-	-	-	323.00	91.00	-
Horndean	-	-	-	403.00	91.00	-
La Riviere	-	-	-	251.00	31,189.27	4,339.96
La Salle	-	8,162.39	5,673.36	14,573.01	7,862.49	4,563.43
Lorette	-	-	-	624.55	21,910.29	18,293.59
MacGregor	-	-	-	6,092.13	28,415.53	1,850.47
Melita	8,806.00	9,536.44	2,102.46	10,172.60	56.42	430.78
Minnedosa	-	-	-	12,478.02	20,989.65	3,354.27
Morden	-	-	2,631.07	20,373.18	23,670.63	25,407.61
Neepawa	-	-	16,088.39	28,785.60	33,242.27	5,118.02
Ochre River	-	-	-	19,271.85	5,756.92	-
Ritchot	4,772.39	13,700.31	-	312.00	-	-
Riverton	-	-	-	6,052.92	15,129.77	4,483.00
Rosenfeld	-	-	-	427.00	14,350.09	253.00
Ste. Anne	-	-	-	482.00	32,963.33	13,064.86
Ste. Rose du Lac	-	-	14,219.19	16,657.66	12,273.59	4,860.16
Sanford	-	-	12,939.42	11,577.82	5,990.65	5,190.43
Souris	14,615.24	13,515.46	3,464.92	11,088.76	44.82	711.69
Starbuck	-	-	7,382.93	13,239.36	27,204.80	16,029.98
Swan River	-	-	-	17,206.72	17,851.50	9,370.26
The Pas	-	-	-	581.00	33,909.89	24,141.17
Thompson	-	-	-	433.00	14.00	-
Virden	-	-	-	146.00	38,866.04	13,250.51
Wawanesa	4,491.00	4,063.76	7,034.36	12,374.19	17.78	430.78
Westbourne	-	-	-	8,239.27	6,148.00	5,167.20
Winnipeg	-	37,563.98	47,660.87	9,585.35	3,461.52	4,724.14
Woodside	-	-	-	1,336.41	1,554.51	5,776.46
Brochure	3,500.00	-	-	-	-	-
TOTAL MAPPING	$76,084.51	$151,031.21	$232,432.90	$466,583.53	$610,495.83	$289,485.54
General Studies	$ -	$ -	$ 2,177.48	$ 6.79	$ 7,357.23	$ 1,923.15
Brandon	-	-	-	-	15,117.52	6,298.16
Carman	-	-	476.85	-	-	-
Gimli	-	-	-	-	2,817.49	60.00
Gladstone	-	-	-	-	-	299.61
Letellier	-	-	-	-	575.93	-
Morden	-	-	-	-	-	3,146.21
Morris	-	-	-	-	195.25	-
Ste. Rose du Lac	-	-	-	3,982.87	8,826.82	1,215.20
Souris	-	-	-	-	4,389.62	1,215.20
Wawanesa	-	-	1,320.00	-	-	-
Winnipeg	-	-	4,368.65	261.08	361.98	-
TOTAL STUDIES	$ -	$ -	$ 8,342.98	$ 4,250.74	$ 39,641.84	$ 14,157.53
Flood Forecasting						
- Phase I	$ -	$ -	$ -	$ -	$ 71,087.91	$172,672.23
- Phase II	-	-	-	-	-	-
TOTAL FLOOD FORECASTING	$ -	$ -	$ -	$ -	$ 71,087.91	$172,672.23
GRAND TOTAL	$77,084.51	$152,286.12	$240,775.88	$471,312.37	$721,890.46	$476,357.30

TABLE I (Continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
EXPENDITURES FOR 1977/89

	1983/84	1984/85	1985/86	1986/87	1987-88	1988-89	1977-89 Total
General Mapping	$ 56,429.23	$ 39,223.22	$ 9,299.64	$ 8,257.55	$ 5,404.21	$ -	$ 320,245.74
Arborg	12,548.35	758.14	3,616.35	1,243.89	8,113.01	-	54,742.59
Assiniboine River	-	-	-	-	-	-	1,032.00
Brandon	1,454.00	-	-	-	-	-	196,345.25
Carman	810.00	6,316.15	45.00	-	-	-	92,355.67
Dauphin	8,732.03	6,099.25	58.50	47.39	-	-	99,960.56
Elie	1,357.25	-	-	-	-	-	67,945.95
Fisher Branch	19,683.03	7,812.66	6,547.29	9,955.30	6,439.69	-	84,885.28
Gimli	-	-	-	-	-	-	32,729.48
Gladstone	5,073.58	10,731.74	-	-	-	-	52,014.20
Grande Pointe	2,006.97	-	-	-	-	-	28,758.84
Gretna	-	-	-	-	-	-	18,722.40
Hartney	-	-	-	-	-	-	414.00
Horndean	-	-	-	-	-	-	494.00
La Riviere	-	-	-	-	-	-	35,780.23
La Salle	72.48	-	-	589.16	-	-	41,496.32
Loretta	6,809.60	4,235.61	777.50	47.39	-	-	52,698.53
MacGregor	29.97	-	-	-	-	-	36,388.10
Melita	-	-	-	-	-	-	31,104.70
Minnedosa	544.21	12,343.65	-	-	-	-	49,709.80
Morden	27,302.71	4,115.90	4,581.00	8,842.55	7,197.53	-	124,122.18
Neepawa	561.33	28,840.80	3,454.34	4,271.45	3,612.22	-	123,974.42
Ochre River	199.30	-	-	-	-	-	25,228.07
Ritchot	-	-	-	-	-	-	18,784.70
Riverton	16,382.52	9,119.84	1,814.31	4,478.67	7,350.89	-	64,811.92
Rosenfeld	-	-	-	-	-	-	15,030.09
Ste. Anne	319.42	-	-	-	-	-	46,829.61
Ste. Rose du Lac	-	-	-	-	-	-	48,010.60
Sanford	72.46	-	-	-	-	-	35,770.78
Souris	-	-	-	-	-	-	43,440.89
Starbuck	1,651.61	-	-	-	-	-	65,508.68
Swan River	6,182.67	-	-	-	-	-	50,611.15
The Pas	18,866.90	-	373.38	3,235.90	8,193.76	-	89,302.00
Thompson	-	-	-	-	-	-	447.00
Virden	7,547.42	-	373.39	1,918.90	5,817.75	-	67,920.01
Wawanesa	-	-	-	-	-	-	28,411.67
Westbourne	3,505.82	-	-	-	-	-	23,060.29
Winnipeg	9,624.95	-	5,830.96	40,981.18	9,865.23	-	169,298.18
Woodside	-	-	-	-	-	-	8,667.38
Brochure	-	-	-	-	-	-	3,500.00
TOTAL MAPPING	$207,767.81	$129,596.96	$ 36,771.66	$ 83,869.33	$ 61,994.29	$ -	$2,349,553.46
General Studies	$ -	$ -	$ 2,177.48	$ 8,433.13	$ 7,566.60	-	$ 75,449.89
Arborg	-	-	-	-	34.00	-	34.00
Brandon	-	-	-	-	-	-	21,415.68
Carman	-	-	-	-	-	-	476.85
Elie	-	3,657.17	13,562.22	971.19	-	-	18,190.58
Gimli	-	-	-	-	-	-	2,877.49
Gladstone	-	-	-	-	-	-	299.61
Letellier	-	-	-	-	-	-	575.93
Morden	411.55	7,371.52	21,034.43	21,765.00	23,524.53	-	77,253.24
Morris	-	-	-	-	-	-	195.25
Riverton	-	6,848.73	22,474.67	23,544.60	26,498.96	-	79,366.96
Ste. Rose du Lac	-	-	-	-	-	-	14,024.89
Souris	-	-	-	-	-	-	5,604.82
Wawanesa	-	-	-	-	-	-	1,320.00
Winnipeg	-	-	69.87	69.87	-	-	5,131.45
TOTAL STUDIES	$ 411.55	$ 26,568.60	$ 96,435.52	$ 54,783.79	$ 57,624.09	$ -	$ 302,216.64
Flood Forecasting							
- Phase I	$109,858.63	$ -	$ -	$ -	$ -	$ -	$ 353,618.77
- Phase II	15,887.29	118,349.63	102,294.36	114,505.49	114,988.97	115,002	581,027.74
TOTAL FORECASTING	$125,745.92	$118,349.63	$102,294.36	$114,505.49	$114,988.97	$115,002	$ 934,646.51
GRAND TOTAL	$333,925.28	$274,515.19	$235,501.54	$253,158.61	$234,607.35	$115,002	$3,586,416.61

TABLE 2
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Arborg	completed	87 11 05		
Assiniboine River	no	Because of the high cost of mapping, this project will not be done.		
Brandon	completed	82 03 26	completed	
Brunkild	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Carman	completed	84 06 13	completed	
Dauphin	completed	84 02 15		
Dominion City	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Elie	completed	80 11 05	unfinished	
Emerson	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Fisher Branch	completed	87 11 05		
Gimli	completed	No further activities will be done under this Agreement as the Province will be constructing a diversion to control flooding.		
Gladstone	completed			

TABLE 2 (continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Grande Pointe	completed			
Gretna	completed			It is unlikely that flood risk maps will be prepared as the community is affected from overflows of the Pembina River located on the U. S. side.
Hartney	no			No work is planned because of low flood potential.
Horndean	no			No work is planned because of low flood potential from overflows of the Hespeler Channel
La Riviere	completed			
La Salle	completed	82 11 26		
Letellier	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Lorette	completed	84 09 13		
MacGregor	completed			
Melita	completed	79 12 20 (I)		Interim designation based on existing topographical maps.
Minnedosa	completed			
Morden	completed		continuing	
Morris	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba

TABLE 2 (continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Neepawa	completed			
Ochre River	completed			
Ritchot	no	Will not be done because of the high cost of mapping.		
Riverton	completed	87 11 05	continuing	
Rosenfeld	completed			
Rosenort	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
St. Adolphe	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Ste. Anne	completed			
St. Jean Baptiste	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Ste. Rose du Lac	completed		completed	No further work will be done under this Agreement as flood protection works will be constructed under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Sanford	completed	82 11 26		

TABLE 2 (continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Souris	completed	80 10 01	done (SRBS)	Flood protection works for the Water Treatment Planthouse will be constructed under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Starbuck	completed	82 11 26		
Swan River	completed	82 05 11		
The Pas	completed			
Thompson	no	No work will be done as flood prone lands are under license for water power generation.		
Virden	under way			
Wawanesa	completed	79 12 20 (I)	done (SRBS)	Interim designation based on existing topographical maps
Westbourne	completed	Base maps do not meet specifications.		
Winnipeg	no	80 02 15 (I)		Interim designation based on existing topographical maps.
Red, Assiniboine and Seine Rivers				
La Salle River	completed			
Omands Creek	no			
Woodside	completed			

Notes:
- "done" means action was completed.
- "no" means action will not be done.
- "(I)" means interim designation.
- "SRBS" means study carried out under the Souris River Basin Study.

APPENDIX "A"

AREAS AND FLOODWAYS TO BE MAPPED IN THE PROVINCE OF MANITOBA

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Brandon and R.M. of Cornwallis	Assiniboine River from west of 21-10-19 W.P.M. to east of 19-10-18 W.P.M.	No
R.M. of Portage la Prairie, R.M. of St. Francois Xavier, R.M. of Cartier and the City of Winnipeg	Assiniboine River from Portage la Prairie to the western limit of the City of Winnipeg	No
Carman and R.M. of Dufferin	Boyne River from west of 23-6-5 W.P.M. to east of 29-6-4 W.P.M.	Yes
Gimli and R.M. of Gimli	Overflows from the Gimli Airport Drain. Area to be mapped to be shown on location plan.	Yes
Thompson and L.G.D. of Mystery Lake	Burntwood River (to be shown on location plan)	No
Fisher Branch and L.G.D. of Fisher	Fisher River from west of 14-24-2 W.P.M. to east 24-24-2 W.P.M.	Yes
Arborg and R.M. of Bifrost	Icelandic River from west of 22-22-2 E.P.M. to east of 24-22-2 E.P.M.	Yes
Riverton and R.M. of Bifrost	Icelandic River from south of 17-23-4 E.P.M. to north of 21-23-4 E.P.M.	Yes
Rosenort and R.M. of Morris	Morris River from south of 6-6-1 E.P.M. to north of 7-6-1 E.P.M.	No

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Brunkild and R.M. of MacDonald	Morris River form south of 19-7-1 W.P.M. to north of 30-7-1 W.P.M.	No
Minnedosa and R.M. of Minto	Minnedosa River from west of 3-15-18 W.P.M. to north of 1-15-18 W.P.M.	Yes
Ochre River and R.M. of Ochre River	Ochre River from south of 9-24-17 W.P.M. to north of 15-24-17 W.P.M.	Yes
Gretna and R.M. of Rhineland	Pembina River (in 5-1-1 W.P.M.)	Yes
La Riviere and R.M. of Pembina	Pembina River from west of 25-3-10 W.P.M. to south of 19-3-9 W.P.M.	No
Emerson and R.M. of Montcalm and R.M. of Franklin	Red River from International Boundary to north of 12-1-2 E.P.M.	No
Letellier and R.M. of Montcalm	Red and Aux Marais Rivers from south of 18-2-2 E.P.M. to east of 20-2-2 E.P.M.	No
Morris and R.M. of Morris	Red and Morris Rivers from east of 35-4-1 E.P.M. to east of 2-5-1 E.P.M.	No
St. Jean Baptiste and R.M. of Montcalm	Red and Plum Rivers from south of 36-3-1 E.P.M. to north of 1-4-1 E.P.M.	No
R.M. of Ritchot and the City of Winnipeg	Red River from southern limit of R.M. of Ritchot to Red River Floodway Control Structure	Yes
Elie and R.M. of Cartier	La Salle River from north of 11-11-3 W.P.M. to south of 2-11-3 W.P.M.	Yes
Starbuck and R.M. of MacDonald	La Salle River from west of 26-9-2 W.P.M. to east of 25-9-2 E.P.M.	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Sanford and R.M. of MacDonald	La Salle River from north of 30-8-1 E.P.M. to south of 29-8-1 E.P.M.	Yes
R.M. of Ritchot, R.M. of MacDonald and the City of Winnipeg	La Salle River from east of 32-8-2 E.P.M. to Red River	Yes
Dominion City and R.M. of Franklin	Roseau River from north of 19-2-3 E.P.M. to east of 20-2-3 E.P.M.	No
The Pas and L.G.D. of Consul	Saskatchewan River Pasquia River to Rahl's Island	Yes
Grande Pointe and R.M. of Ritchot	Seine River from Grande Pointe (west of 20-9-4 E.P.M.) to Red River Floodway	Yes
Lorette and R.M. of Tache	Seine River from west of 8-9-5 E.P.M to the quarter section line of 9-9-5 E.P.M.	Yes
Ste. Anne	Seine River within the Village of Ste. Anne	Yes
Winnipeg	Sturgeon Creek from P.T.H. No. 101 to Assiniboine River	No
Melita and R.M. of Arthur	Souris River from west of 31-3-26 W.P.M. to east of 6-4-26 W.P.M.	No
Hartney and R.M. of Cameron	Souris River from Hartney Dam to west of 17-6-23 W.P.M.	No
Souris and R.M. of Glenwood	Souris River from south of 33-7-21 W.P.M. to one half mile east of P.R. 250	No

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Wawanesa and R.M. of Oakland	Souris River from west of 23-7-W.P.M. to east of 26-7-17 W.P.M.	No
Swan River and R.M. of Swan River	Swan River from south of 26-36-27 W.P.M. to east of 28-36-27 W.P.M.	Yes
Ste. Rose du Lac and R.M. of Ste. Rose	Turtle River from Ste. Rose Dam to north of 8-24-15 W.P.M.	Yes
Dauphin and R.M. of Dauphin	Vermillion River from quarter section line of 4-25-19 W.P.M. to north of 15-25-19 W.P.M.	Yes
Gladstone and R.M. of Westbourne	Whitemud River from west of 30-14-11 W.P.M. to east of 32-14-11 W.P.M.	Yes
Westbourne and R.M. of Westbourne	Whitemud River from P.T.H. No 4 to north of 25-13-9 W.P.M.	Yes
Woodside and R.M. of Westbourne	Whitemud River from west of 16-14-1 W.P.M. to east of 9-14-10 W.P.M.	Yes
Neepawa and R.M. of Langford	Whitemud River from southern Town Limit to north of 34-14-15 W.P.M.	No
Morden and R.M. of Stanley	Dead Horse Creek from Morden Dam to north of 8-3-5 W.P.M.	Yes
Virden and R.M. of Wallace	Gopher Creek from north of 27-10-26 W.P.M. to south of 15-10-26 W.P.M.	Yes
Hordean and R.M. of Rhineland	Hespler Channel from quarter section line of 9-3-2 W.P.M. to quarter section line of 10-3-2 W.P.M.	Yes
Rosenfeld and R.M. of Rhineland	Overflows from Hespeler Channel. Area to be mapped to be shown on location plan	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
MacGregor and R.M. of North Norfolk	Beaver Creek. Area to be mapped to be shown on location plan	Yes
Winnipeg and Additional Zone	Red and Assiniboine Rivers and Tributaries	Yes

APPENDIX B

Location of Areas in the Canada – Manitoba Flood Risk Mapping Agreement

LEGEND:

- ● Designated areas
- ○ Areas to be designated